Spring 1991

South Dakota Farm and Home Research

South Dakota State University

South Dakota Farm & Home
RESEARCH
Agricultural Experiment Station • South Dakota State University • Brookings, South Dakota 57007
Volume 42, number 1, spring 1991

NORTHERN PLAINS BIOSTRESS LABORATORY

GROUND BREAKING!

SDSU

South Dakota Farm & Home
RESEARCH

Volume 42, number 1, spring, 1991

South Dakota State University
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Published by the Agricultural Experiment Station, South Dakota State University, Brookings, South Dakota. Sent free to any resident of South Dakota in response to a written request.

South Dakota Farm & Home Research is edited and designed in the Department of Agricultural Communications, SDSU, and printed on campus at the SDSU Printing Laboratory.

Published in accordance with an act passed in 1881 by the 14th Legislative Assembly, Dakota Territory, establishing the Dakota Agricultural College, and with the act of re-organization passed in 1887 by the 17th Legislative Assembly, which established the Agricultural Experiment Station at South Dakota State University. An Equal Opportunity Employer.

7500 printed by AES at a cost of 68 cents each. AX036--5/91

About the Cover

The ground breaking ceremonies for the Northern Plains Biostress Laboratory feature a bulldozer instead of the traditional shovel. The bulldozer symbolizes action and the power that will be directed toward the goals of the NPBL.

Illustration: Duane Hanson

Contents

For this special issue of *Farm & Home Research*, I have decided to forego my usual Director's Comments column. Instead, we have some special words on the ground breaking of our new Northern Plains Biostress Laboratory from South Dakota State University President Robert T. Wagner.

--R.A. Moore

Robert T. Wagner

Director's comments

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Welcome to our Friends:

We welcome you to these ground breaking ceremonies for the Northern Plains Biostress Laboratory.

This day is a great day!

A great day for our university! Today symbolizes the beginning of renewed commitment to our land-grant mission, the serving of students and citizens through instruction, research and extension. This laboratory marks our vigorous dedication to high quality undergraduate and graduate programs, competitive research in selected areas important to South Dakota and our neighboring states, and nationally recognized extension efforts specifically directed to provide beneficial information to clients in our region.

A great day for our College of Agriculture and Biological Sciences! It fulfills a dream of over 12 years, the construction of a spacious, well-equipped facility that includes laboratory, classroom and office space for plant scientists and biologists. It also houses our Horticulture, Forestry, Landscape and Parks and Wildlife and Fisheries programs.

A great day for regional agriculture! This laboratory will support new agricultural technologies that help crops, livestock and humans cope with environmental and biological stress, sustain soil productivity and assure profitable agriculture, preserve sufficient water supplies for the region and guarantee a healthful environment for all life, including humans.

Thank you for joining us in this great celebration! Thank you, even more, for helping us achieve this great goal. When this facility is completed, it will help us serve even more effectively in the great tradition of land-grant universities.

Cordially,

Robert T. Wagner
President

photo: Hal Werner

THE BASICS OF BIOSTRESS

Dr. R.A. Moore

There are times when we say, "Isn't this a great day." The temperature, the freshness of the air, the sun and slight breeze seem "perfect."

We do get those days. But we also get the not-so-perfect days—the late spring freeze that kills the wheat's new growth, the summer wind that dries young corn, the sudden blizzard

"The concept behind biostress research is simple: No one research project, let alone one scientist, provides a complete answer."

-- R. A. Moore

during calving season, the aphids, borers, viruses.

This is, after all, South Dakota, where our natural resources are fragile, our environment unpredictable, and our economic and social conditions unstable. This is South Dakota, where lower crop yields and poorer livestock productivity will appear in some county every year because of biostress.

Even as a perfect day is a combination of breeze, sunlight, and comfortable temperatures, calving stress is magnified when the temperature drops, the wind rises, and it snows heavily. Biostress on humans, livestock and pets, crops and gardens is, in fact, most often a combination of stresses.

It is logical, then, to address this combination of problems with more than one response. The concept behind biostress research is simple: No one research project, let alone one scientist, provides a complete answer.

That seems obvious. We have made great strides in agricultural production by one-discipline studies. But we also know the value of working together, because we have done it. The Northern Plains Biostress Laboratory (NPBL) provides a greater opportunity for cooperative work. Although it cannot possibly house all of our biostress projects, it represents—in bricks and mortar—our commitment to this new focus of cooperative research.

The NPBL will house the Horticulture, Forestry, Landscape and Parks Department, the Wildlife and Fisheries Sciences Department, and portions of the Biology, Plant Science and Animal and Range Sciences departments.

When the building program is completed to the level we anticipate, we will have animal stress research in new annexes to the Animal Science Complex and the Veterinary Science building.

But even that does not give the complete picture of biostress researc across the campus and the state. We

NPBL Objectives

For more than 100 years, research at SDSU has helped enhance rural life and develop the economic, human, and natural resources of South Dakota and rural America. The objectives of the Northern Plains Biostress Laboratory continue this mission:

1. Finding new technologies that cope with environmental and biological stresses of major crops and animals.

2. Sustaining soil productivity through farming practices that control erosion and minimize nutrient depletion.

3. Protecting our water so that it meets quantity and quality standards for personal, agricultural, industrial, municipal, and recreational uses.

4. Revitalizing rural South Dakota through the development of human and natural resources.

5. Providing a healthful environment for humans.

6. Transferring to the public information that improves production efficiency and agricultural stability and profitability.

photo: M.K. McFarland

R.A. Moore has helped bring scientists and ag producers together in a strong commitment to biostress research. Teams of researchers, with greater lab space, and the finest equipment, will use their talents and skills to solve problems in South Dakota, the region, and around our world.

are re-examining and redirecting our work in all departments and units of the College of Agriculture and Biological Sciences. We are evaluating all work at the field stations across the state.

Our focus is clear: Scientists will work together across their specialties to solve the serious problems of biostress. This is how we will continue meeting the needs of the people we serve.

There is, I believe, an even deeper reason for our commitment to this focus. All of us, scientists and producers, all South Dakotans, have enlarged our vision. We see hunger, even here in South Dakota. We see oil spills and pollution from well fires, even if half a world away. We see the stripping of soil and the contamination of water; of course we are particularly concerned about the loss to natural resources here in South Dakota.

Fortunately, we have other resources in great supply—our state's scientists and ag producers—that can solve these problems.

The NPBL gives focus to these efforts. It is the center of a University-wide commitment to biostress research. The goals that have led us to ground breaking for the NPBL are worthy; they will be achieved. They are a powerful set of aspirations.

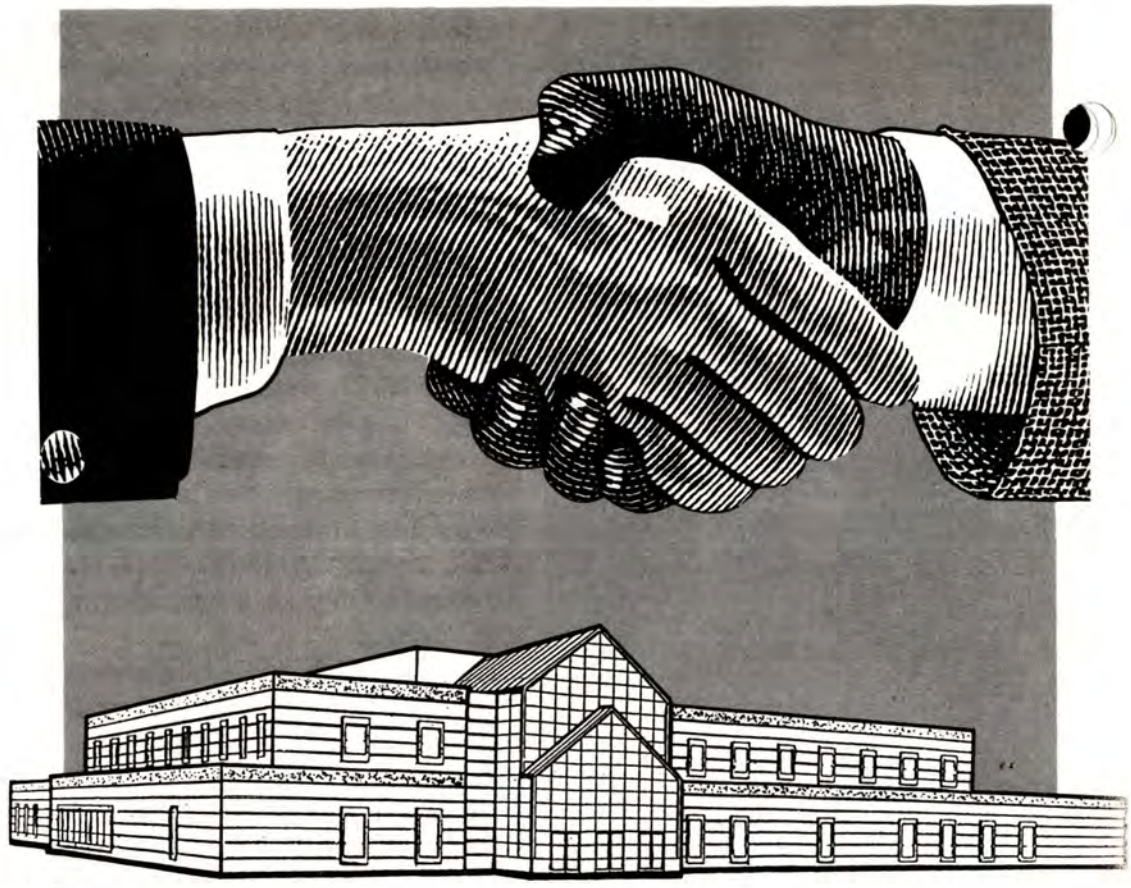
In the NPBL, we will have more space, the finest equipment, and the opportunity for scientists from different specialties to work with each other. It will be, as one of our department heads has said, where working together will have greater impact than working alone. The NPBL is truly "greater than the sum of its parts."

I emphasize that biostress research is nothing new for the Agricultural Experiment Station. This station has been conducting such work since its opening over 100 years ago. A focus on biostress fits the mission of the Experiment Station. In fact, it is the mission restated: the enhancement of quality of life.

Our impatience to begin these tasks is why we chose a bulldozer for our ground-breaking ceremonies instead of the traditional shovel. The power of the bulldozer symbolizes the power we direct toward our goals. It symbolizes action.

And we want action. We want the dirt flying, the building going up. We want to move in and get going on this big job.

Dr. R.A. Moore is Director of the South Dakota Agricultural Experiment Station.



RELATIONSHIP BUILDING EQUIPS BIOSTRESS BUILDING

Forging strong new relationships between SDSU and nontraditional sources of funding will put state-of-the-art equipment in the Northern Plains Biostress Laboratory

Dr. R.A. Battaglia

When the Northern Plains Biostress Laboratory (NPBL), is completed in 1993, more than $2 million in equipment—some old, some new—will be moved in.

That equipment is the story of another type of "building."

The process is "relationship building." It is a relationship between equals: on the one side are donors and on the other side are recipients—SDSU and the people of South Dakota.

The NPBL will be built, thanks to the hard work of people on this

campus and to the foresight of legislators in Pierre and our supporters in Washington. But the NPBL needs a full complement of state-of-the-art equipment.

So we are doing what we must do—seeking money from nontraditional sources. Most land-grant universities, including SDSU, have a resource mix of about 85 percent traditional (local, state, and federal) funding and 15 percent nontraditional (grants, gifts) sources. Nearly all educational leaders today see the need to reach at least a 50-50 mix. It is simply a matter of economics. It is my role to seek out and procure this outside, nontraditional funding—funding from places where we have not looked before.

But it's not a matter of simply dropping in at a Ford or a Rockefeller or a Kellogg foundation or a Pillsbury or a Quaker or a Sandoz corporate office and saying, "Hello, we need some money for this excellent project we are planning."

It is months, sometimes years, from initial contact to final decision. In between are case statements, rationales, justifications, publications, even scale models of the project. Potential donors will ask as many questions about the University and its community of scholars as they ask about any specific project. These efforts are the core of relationship building.

Seeking outside funds is not new. Members of the faculty have been doing it for years, and have successfully found support for their individual research. What is new, however, is the coordinated, University-wide approach.

The NPBL is a case in point. "Wish lists" for new equipment came from many departments across campus. Not all of what we acquire will go into the new building. While the NPBL will be the focus of the campus-wide biostress center-of-excellence project at SDSU, not all of the people who conduct biostress or quality-of-life research can possibly be located in one building.

When I first started on this project about two years ago, I went down the lists of possible philanthropic donors, and tried to match their interests with our needs list. If there was no existing relationship between them and us, I wrote an initial letter.

A far speedier method, one in which relationships have already been built, is to work directly with a representative from a stake-holder commercial enterprise, a company that already has an interest in the agricultural productivity of the Northern Plains.

Even with this much more efficient approach, no one development officer could work with every enterprise, commodity association, or corporation in the Northern Plains. But many of SDSU's administrators, scientists, teachers, and Extension people already have strong existing relationships with potential-donor companies. They have met in test plots, shared the podium at meetings, or, over a cup of coffee, have brought each other up to date on their work. These are extremely valuable contacts in building relationships.

One kind of support we are seeking is for "named labs," in which the donor organization supplies all equipment for a lab, whether in human nutrition, animal health, or molecular biology.

We are enthusiastic about going a step beyond that.

We visualize, for example, a soil and water lab sponsored and

"Potential donors will ask as many questions about the University and its community of scholars as they ask about any specific project. These efforts are the core of relationship building."

--Richard A. Battaglia

photo: M.K. McFarland

Philanthropic organizations and corporations will contribute to stocking the NPBL with the finest equipment. The relationships Richard Battaglia is developing will benefit donors, SDSU, and the people of South Dakota and the region.

equipped by a consortium of three or four chemical companies. This would be an integrated systems lab where the most basic of questions are studied: How do chemicals bind or move in the soil? Get into ground water? Can we slow down this movement with a certain species of plant or with a certain cultural method?

For the chemical companies in the consortium, such a lab represents a stake in South Dakota agriculture for the future, an agriculture that is environmentally, socially, and economically sound. All parties—companies, producers, South Dakota citizens, SDSU—benefit.

Philanthropic organizations are in the business to provide money for causes that benefit society. Within very broad guidelines, the money is for the proposal that we created and submitted.

Other donors are corporations. These folks have a stockholder-driven awareness of the "bottom line." The money that they would donate comes from their marketing and research funds.

Such corporations need us as much as we need them. They respect our reputation for unbiased research. Neither we nor they are about to jeopardize that reputation. We have different functions which do not overlap: Companies are in the business to sell products to producers. On the other hand, SDSU is in business to provide research-based information to producers.

If you still aren't comfortable, remember that we always have a built-in safety factor.

We do not hide the results of our research. We publish, whether the information is favorable or unfavorable to a company. Such honesty is precisely what reputable donors, confident of their product lines, want.

We will reach our equipment goal for the NPBL. As we do, keep in mind: That goal is just one stop on the way toward reaching our ultimate goal—a better life for us and our families here in South Dakota.

Dr. Richard A. Battaglia is Development Officer and Director of Special Funding for the SDSU Foundation and the College of Agriculture and Biological Sciences.

BREAKING the boundaries

For the departments slated to occupy the Northern Plains Biostress Laboratory, the emphasis is on cooperative research

How will the new Northern Plains Biostress Laboratory at South Dakota State University affect the departments that will occupy it? What research opportunities does this present? What are some of the related benefits as seen by the heads of these departments? And, what are their observations concerning the exciting activities that lie ahead?

Farm and Home asked these and other questions of the four department heads. Here are the results:

Plant Science

Dr. Dale Reeves, acting head of the department, says one big change for his department is that plant breeders and some other faculty, who basically have no laboratories at present, will enjoy such facilities in the new biostress lab.

"One of the major things we gain is the number of labs for our various types of research," he said. About 14 Plant Science Department faculty in crops, soils, and entomology, plus support staff and graduate students, will make the move.

Reeves looks forward to having access to equipment now unavailable to his researchers because of space and cost limitations.

He said the facility offers great benefits in encouraging cross-departmental projects, but one highly important benefit is its ability to move biostress research from the "back burner" and make it more visible to the public.

"Such research isn't always the type of exciting, gripping, event that grabs public attention," said Reeves. "As a result, public support for this activity isn't always what it ought to be—despite the tremendous importance it has for every man, woman, and child in our state and nation.

"We have to bear in mind that even a small breakthrough such as a half-percent increase in the stress resistance of wheat can have a tremendous impact on the economy of our state, so this activity needs and deserves public understanding and support," he said.

"The mere fact that SDSU has devoted an entire building to the biostress research mission will do a lot to demonstrate the type of priority this activity deserves," Reeves concluded.

Biology and Microbiology

Dr. Charles McMullen, head of the department, says research modules for cellular and molecular biology, plant physiology and tissue culture, and animal and human stress represent the heart of the new biostress laboratory. Each offers distinct opportunities to a department like his.

McMullen will move about 10 of his 23 professional personnel to the new lab, and the remainder will stay in their present Ag Hall facilities.

Sharing sensitive, expensive pieces of research equipment among departments also is a major advantage offered by the new facility. "Without this feature, none of us could afford to have ready access to such equipment," he explained.

Without such access, certain types of research are either impossible or too inefficient and cumbersome to conduct, he said.

The new lab also is useful for attracting certain, highly skilled, research specialists to the University. Such a person may welcome an opportunity to work in a well-equipped facility like ours, he explained. Otherwise, these special personnel are difficult—if not impossible—to recruit to the SDSU research staff.

Yet another advantage is that the interdisciplinary nature of the research activities in this state-of-the-art facility will make SDSU much more competitive for the larger

photo: Larry Tennyson

Nels Granholm shows mice used in biostress related research to Charles McMullen, Biology and Microbiology Department head.

research grants that have been unavailable to the school to this point. That, in turn, will tend to involve even more staff members in the quest for answers to biostress related research problems.

"As I see it, the key to future successes in this new biostress research facility is to keep restrictive departmental boundaries as minimal as possible and, instead, emphasize the interdisciplinary approach. In fact, that's the basis of the design of the building. Work areas are common to certain types of research tasks, and all those engaged in those research tasks are thrown together, as it were, regardless of their departmental home," he said.

"This facility will have a tremendous effect on the whole University," McMullen predicted.

Horticulture, Forestry, Landscape and Parks

Dr. Carter Johnson's department—including 10 or 11 faculty—will be moved to the new facility, and he

Photo: Duane Hanson

The common denominator for all the departments moving to the NPBL is increased laboratory space and equipment. The additional labs will make many new cooperative research projects possible.

hopes eventually to have a connecting passageway between the lab and an adjacent horticulture building.

"This would enable our scientists to transport plants in the middle of the winter from one facility to another for research work," the department head explained.

"The new facility will make a huge difference to us in our research efforts," he continued, "not the least of which is that all of our scientists will be housed together. We've been split between two buildings, and this has not been helpful in terms of coordinating the program and encouraging various staff to work together."

The research equipment will be "several cuts above" that presently available, he said. This will increase not only the quantity of research, but also the quality.

Having the new facility also has the potential to do kinds of research not presently possible. "One example is the tissue-culture capability that we presently do not have," he said.

Tissue culturing allows scientists to screen plants indoors for drought and temperature stress, salt tolerance, and other factors. Screening plants indoors before planting outdoors speeds up the whole process of introducing plants that are stress resistant.

"Typically, we first must identify a good candidate, then plant it in the field. If it's an annual plant, we then wait a year for results—or, if it's a perennial, we wait 5, 10, or even 15 years before we really know if a plant will be able to withstand South Dakota conditions," he said.

By testing indoors, good candidates are not only easier to find, but they're also much easier to multiply using tissue culture techniques. This enables the product to be made available faster to people who can use it, he said.

Johnson particularly looks forward to speeding up forestry research in shelterbelt trees. "Agriculture depends on windbreaks here, and we need to have tough plants that can take our current cold and droughty conditions—and, with the changes we are seeing in our weather patterns, these conditions are perhaps becoming even tougher," he said.

Research challenges are ongoing, he continued. "We get surprised about every 15-20 years. We sometimes think we have developed a plant variety that will be able to withstand South Dakota conditions throughout its normal lifetime. Then,

"We have to bear in mind that even a small breakthrough such as a half-percent increase in the stress resistance of wheat can have a tremendous impact on the economy of our state . . ."

--Dale Reeves

". . . a lot of these problems require teams of scientists from many disciplines to work out a solution. This lab will move us quickly toward that type cooperation."

--Carter Johnson

something completely unforeseen happens. Last year, for instance, we had a very warm fall followed by a bitterly cold December. Plants at McCrory Gardens that had been growing well for 15-20 years suddenly got severe winter burn."

"If we could discover a means of screening plants for those once-in-a-decade stress conditions, we could save a lot of energy and investment in the horticultural enterprises of this state," he said. "That's one research problem we want to solve as quickly as we can.

"Working with greater speed on challenges like this is a major advantage in having this new biostress laboratory," Johnson said, "but the lab also will enable us to form new, interdisciplinary teams of researchers. We've traditionally been highly structured into departments, but a lot of these problems require teams of scientists from many disciplines to work out a solution. This lab will move us quickly toward that type cooperation."

Wildlife and Fisheries Sciences

Almost all problems relating to South Dakota's wildlife and fish species relate to stress factors of one type or another, according to Dr. Chuck Scalet, head of the Department of Wildlife and Fisheries Sciences.

The new biostress laboratory signifies the end of a huge research handicap for his department. Departmental personnel are scattered in three separate locations across campus, although most are housed in a building erected in 1899.

Moving into the new facility will be eight faculty, seven staff personnel, 36 graduate students, and others.

"The biostress laboratory will allow us to accomplish a variety of additional biostress-related research tasks that are presently beyond our capabilities," said Scalet. "In addition, sharing these laboratory facilities with scientists representing other areas of the biological sciences will create a synergistic research atmosphere in which the sum of our efforts will be greater than the total of what each department could accomplish individually."

Completion of the lab also will enable those in Scalet's department to tackle new types of research. Presently, they must rely primarily on their opportunities for field research, but coupling both the field and laboratory types of scientific investigation will greatly improve the future predictability of such efforts, he said.

One of his department's primary research objectives focuses on ways fish and wildlife species interact with their agricultural environment, but Scalet sees this as just part of a much broader, highly interrelated set of research challenges.

"Our discipline is one of the biological sciences. As such, our research interests have much in common with those of nearly every department in our entire college," he explained.

"The possibility of global warming, for example, is as important to our particular branch of the biological sciences as it is to those one tends to think of as strictly agricultural.

"Our scientific investigations relate to research problems in their areas, and their investigations relate to problems in ours. Biostress is a research challenge that simply can't be compartmentalized," Scalet said.

The writer is Dr. Larry Tennyson, Department of Agricultural Communications

research notes capsule updates on South Dakota Experiment Station research

Irradiated foods are safe. Will they attract buyers?

Consumer suspicions about chemical preservatives lend urgency to food safety research. The alternative to chemicals is irradiation; 30 years of research have settled the safety issues.

Still in doubt is the nutritional question: how irradiation changes the physical characteristics of cereal grains or the storage time of fresh produce. This project identifies those changes. *Principal investigator: Dr. Mike Crews, Department of Nutrition and Food Science, College of Home Economics, SDSU.*

Herbicide removes nurse crop before its thirst gets too big

Alfalfa that is clear seeded can suffer from weeds and erosion. Alfalfa seeded with a nurse crop has to compete with the companion crop for available moisture. Now there's an alternative.

When an oat companion crop was removed after it had attained a 2-inch height with the grass-selective herbicide Poast, the first-year alfalfa yield was improved and erosion was still checked. *Principal investigator: B.S. Curran, graduate research assistant, Plant Science Department, SDSU.*

Diagnostic kit opens way to early treatment of calf diarrhea

Until now, a calf usually had to be killed if you wanted to know the exact cause of its diarrhea. That seems excessive. However, such drastic measures have been necessary because four very different pathogens with four different treatments cause the same symptoms in newborn calves and cost producers $100 million annually.

With feces collected from the live animal, diagnosis with the techniques developed by SDSU veterinary microbiologists is accurate for two of the four pathogens and is faster than the old method of electron microscopy. This means producers could start immediate treatment. The scientists are investigating the possibilities of marketing a commercial diagnostic test kit for veterinarians in the field. *Principal investigator: Dr. D.A. Benfield, Department of Veterinary Science, SDSU.*

Kit will protect animal and human health in confinement buildings

A state-of-the-art livestock facility can turn into a health risk for animals and their caregivers. SDSU researchers have prepared an on-farm testing kit called "Scan-Air" ™ to monitor gas concentrations, locate drafts, measure temperatures and relative humidities, and check fan output. If the test turns up an environmental problem, the producer can call in SDSU experts for more sophisticated analysis and help.

The kit will increase livestock productivity, reduce livestock medication costs, and increase human comfort and health. *Principal investigator: Dr. Don Froehlich, Agricultural Engineering, SDSU.*

Butter stays soft if cows are fed sunflower seeds

Dairy foods researchers are examining milk from cows fed fat sources such as soybeans, sunflower seeds, and safflower seeds. The milk is checked for composition, flavor, and stability, and the milk fat is processed into butter.

So far, they've learned that sunflower seeds in the ration make butter softer at refrigerated temperatures. Flavor and stability are maintained during extended storage. *Principal investigators: Dr. David Schingoethe and Dr. Robert Baer, Dairy Science Department, SDSU.*

'Sharp' HRSW fits into state's growing conditions

'Sharp' is the Experiment Station's newest hard red spring wheat. Its advantages are a combination of yield (.8 bu) and test weight (1.5 lb) better than the standard, Butte 86. Sharp also has agronomic characteristics that match South Dakota conditions. Sharp is early, grows to standard height, and has straw strength slightly better than Butte 86. Protein content is similar.

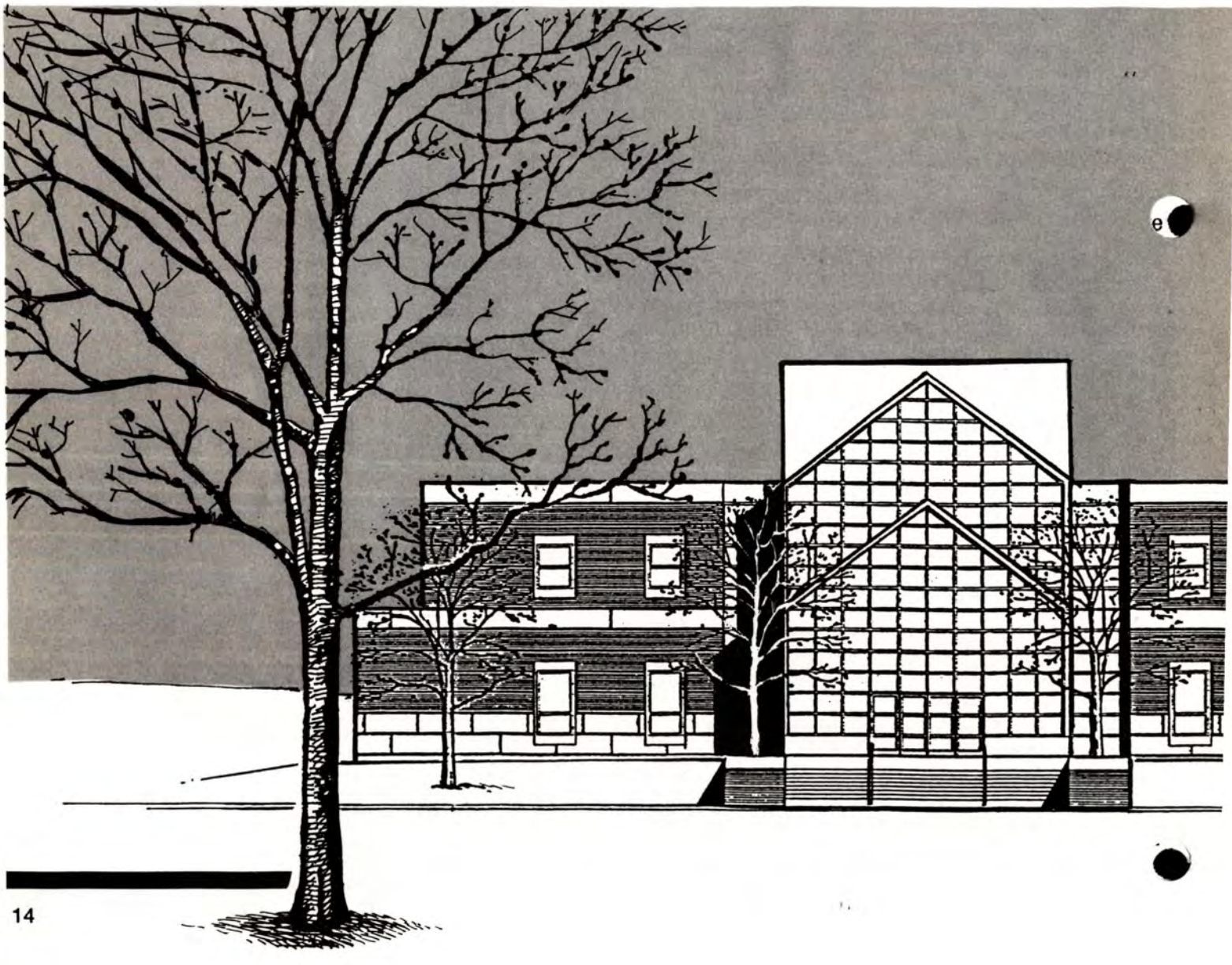
Sharp has resistance to several leaf diseases and has different genes protecting it from leaf rust than Butte 86. *Principal investigator: Dr. Fred Cholick, Plant Science Department, SDSU.*

BRICKS & MORTAR & PROMISE

A building is only a building until it gives skilled and talented teams of scientists the chance to turn problems into promise

No one pair of hands could build the Northern Plains Biostress Laboratory. Instead, many workers and contractors will each provide their special skills.

Nor is one person responsible for the NPBL concept. Instead, farmers, ranchers, and consumers, as individuals and in their organizations; agribusinesses; wildlife groups; cooperatives; elected and appointed officials in South Dakota and Washington, D.C.; and many others, each with their own special talents, give their

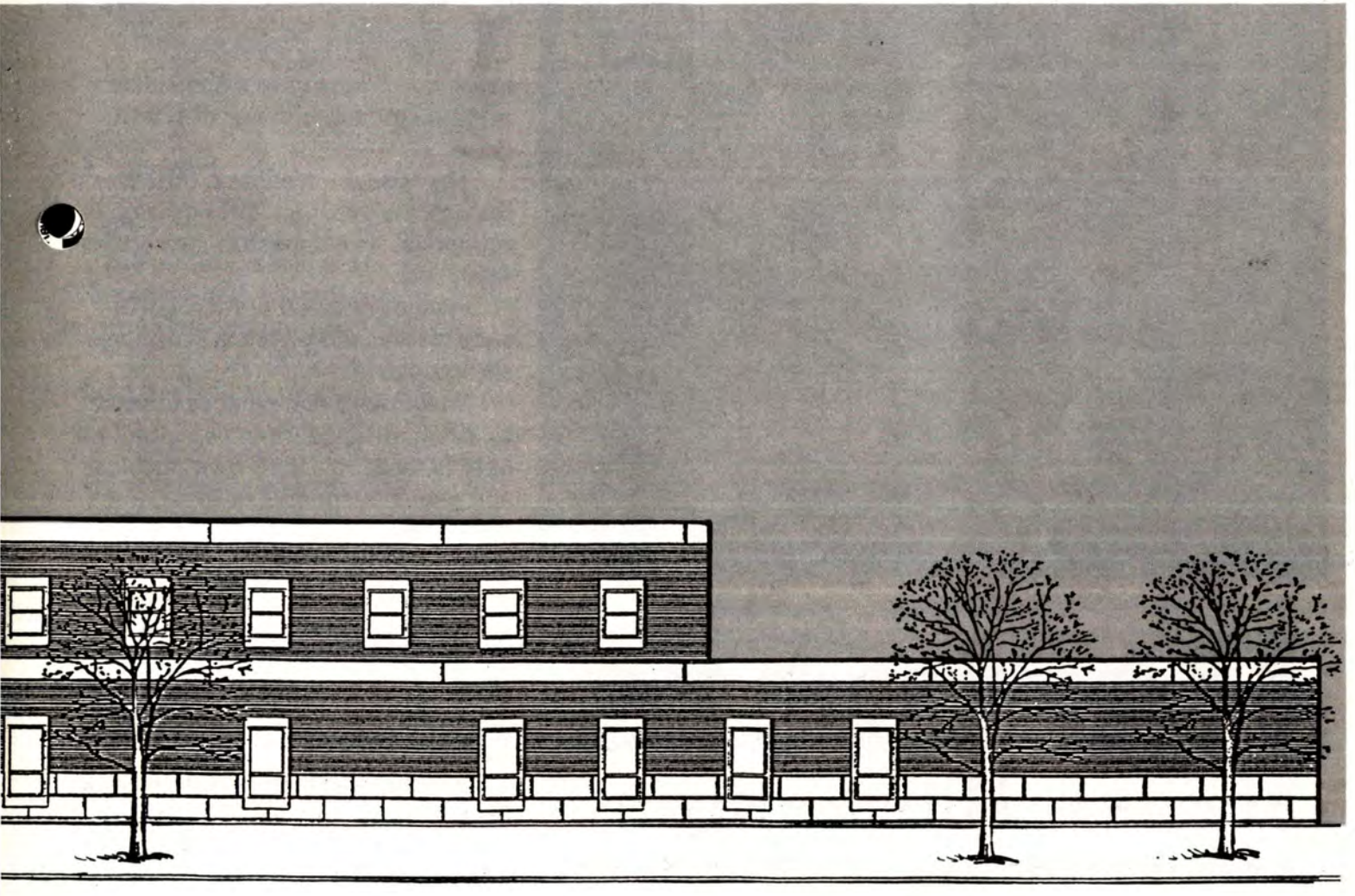


support to biostress research and to the NPBL.

The NPBL scientists will form teams whose members, with their own areas of expertise, will work together to solve different parts of the biostress problem.

The NPBL base facility will house portions of the departments of Plant Science; Biology/ Microbiology; Horticulture, Forestry, Landscape and Parks; Animal and Range Sciences; and Wildlife and Fisheries Sciences. Administratively, these will remain distinct units, but the scientists themselves will combine, dissolve, and again recombine research teams as their investigations call for different approaches. Research "clusters" will develop, as teams concentrate on heat, cold, water deficits, and all the other aspects of biostress.

For the moment, scientists continue their biostress work in other quarters. When the NPBL is completed, focused biostress research that enhances the quality of life of South Dakotans will accelerate; the NPBL will be truly a "center of excellence" for SDSU and South Dakota.



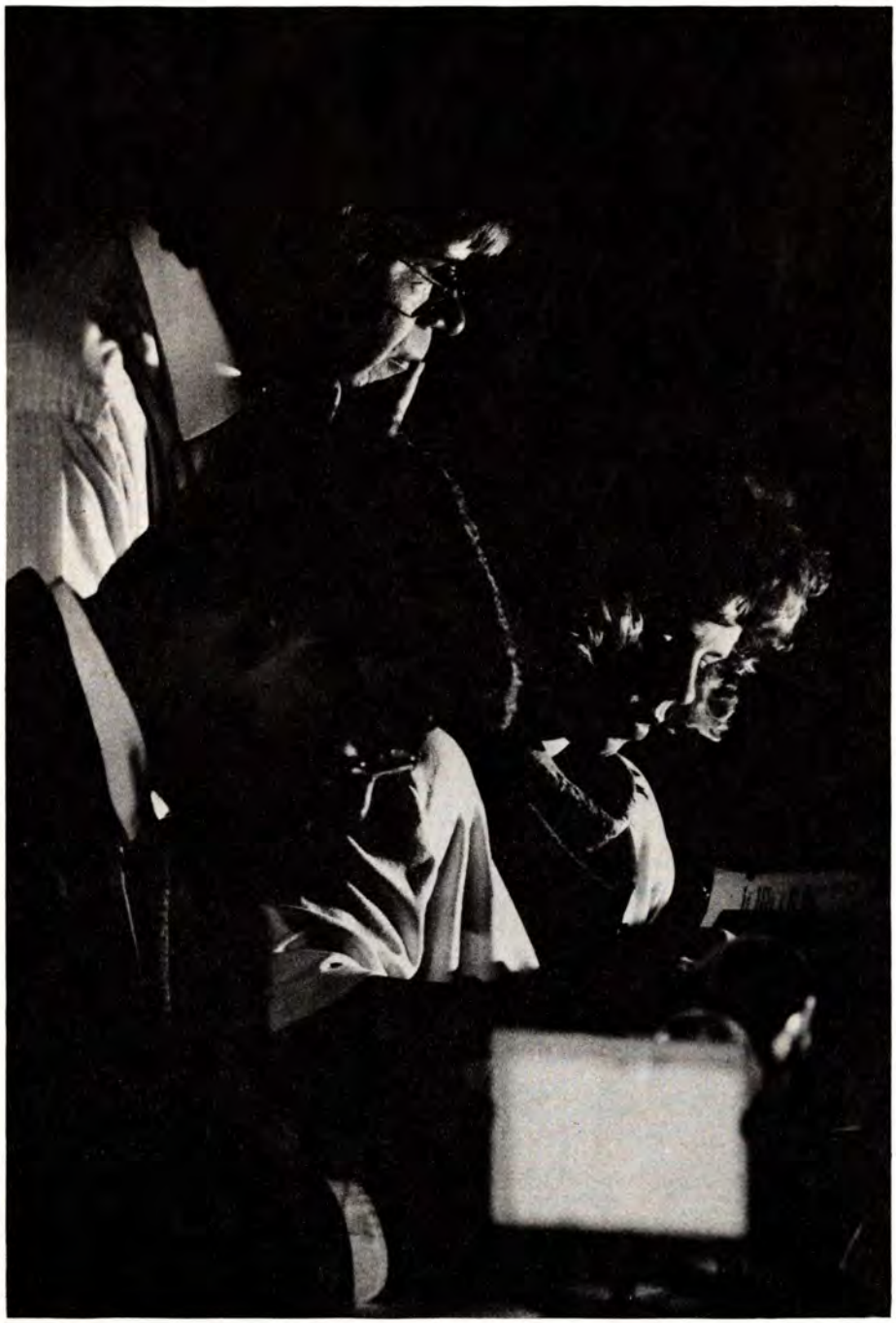


photo: Kevin Schmidt

Partners
across the campus

From art to zoology, the Northern Plains Biostress Laboratory will help SDSU researchers work together on complex issues

It can be a challenge to fully understand the extremely complex nature of biostress research at South Dakota State University.

Some of the common perceptions are that biostress research involves only farm animals and plants; that "biostress" means the negative effects of climate alone; that it is confined to the activities within the Northern Plains Biostress Laboratory itself; that only the scientists from the College of Agriculture and Biological Sciences engage in it.

None of these are accurate, in fact.

Take for example the work of Dr. Dianna Sorenson and many of her colleagues in the SDSU College of Nursing. One of their research projects used a biofeedback machine to help humans deal with stress.

The term, biofeedback, indicates the process by which ones own body recognizes its response to stress, says Sorenson.

Persons often do not recognize such mental and physical symptoms, she explained.

They found that persons affected by stress ultimately can be trained not only to recognize their own physical and mental responses to stress, but also to mentally control or minimize some of these.

This research effort involved Sorenson and her colleague, Carole Howe. Both were trained extensively in the use of biofeedback technique at the famed Menninger Foundation in Kansas.

Another scientific investigation at the College seeks ways to counteract the effects of depression in women following child birth.

"Fatigue is a significant factor in the development of such depression," Sorenson commented. "This may be

true especially in some rural women who, in addition to having a new baby to care for and having to work at a job in town, also may find it necessary to engage in really heavy physical labor on the farm. This truly is a biostress issue."

Still other investigations involve the search for the most efficient and cost-effective methods for treating the various types of stress that affect persons living in rural states like South Dakota.

Alzheimer's disease is yet another area of research, and this is especially meaningful to South Dakota and neighboring states because of their rapidly aging populations, said Sorenson.

"There are lots of possibilities for furthering research like this in the future, due—in large measure—to the investment we're making in the new lab," she said.

Dr. Virginia Clark, acting dean of the College of Home Economics, also has interesting biostress research projects to report.

"Home Economics research as a whole tends to emphasize a preventative—rather than remediation—approach to problems dealing with the effects of the environment on humans," she explains.

Many of the research projects in her college are cooperative and involve faculty from other colleges, including Agriculture and Biological Sciences, she added. Others are funded from several sources, including the S. D. Agricultural Experiment Station.

One of the projects involves studying the growth patterns of South Dakota children who live in areas where high concentrations of Selenium are found in the soil.

Another examines the relationships between diet and blood-cholesterol levels. Still another looks at the occurrence of diabetes in South Dakota Native Americans.

Researchers also are working on the effect of laundering clothing used during pesticide applications and the retention of pesticides in human tissue and breast milk.

"Aspects of child care, housing for the elderly, work roles on the family farm, financial management and decision-making, and stress levels of farm couples are just some of the other avenues of a vast array of the kinds of work we're doing in our research here.

"But, beyond all these projects, we now see increased opportunities for us to engage in even more joint efforts with scientists from other colleges across campus because of the new biostress lab," Clark said.

Dr. Bernard Hietbrink, Dean of the SDSU College of Pharmacy, also believes that biostress is a vast research area. He said that disease in general—whether human, plant, or animal—is associated with biostress.

"That's the widest interpretation, and, on that basis, I suppose almost every research project we do is in biostress. But we also have projects that fit the narrower definition.

"The medicinal and toxic properties of plants and how they affect both humans and domestic animals is just one of the these areas of investigation.

"Other research topics include the various stress effects of dietary Selenium in both humans and domestic animals, the toxic effects of pesticides and herbicides, the process by which certain substances cause cancer and ways to prevent it, and the effects of Radon gas.

"... we now see increased opportunities for us to engage in even more joint efforts with scientists from other colleges across campus because of the new biostress lab"

--Virginia Clark

photo: Larry Tennyson

Virginia Clark, acting dean of the College of Home Economics, examines results from a biostress-related research project with Padu Krishnan, Department of Nutrition and Food Science. Many research activities in the College of Home Economics already involve cooperation with Experiment Station and other SDSU scientists. The Biostress Laboratory will increase the opportunities for such joint research efforts.

"Researchers here only recently synthesized an anti-epileptic chemical agent which they are now having patented and tested," he said.

All these investigations relate to biostress in one way or another, the Dean explained.

Heitbrink agreed with Dr. Clark that building the new biostress laboratory will broaden the opportunities for joint research efforts involving staff from various departments and colleges.

He sees the lab offering not only greater opportunities to work together, but also serving as a source of more new research ideas that will expand the range of activities for all departments.

The lab also may encourage expansion of the array of graduate programs now offered at the University, he said.

"Success also breeds success," he continued.

"SDSU's success in raising and in investing more than $12 million to build such a facility will bring this school further success in winning competitive research funding," he explained.

"One of the reasons we have had difficulty attracting research funding to this institution...is because we don't have a strong reputation...as a research institution. Spending $12 million on such a facility is a good indication to those people who make funding decisions that we've made a serious move to improve that reputation," Heitbrink said.

Biostress research may take on an entirely different character among the various departments of the College of Arts and Sciences.

College Dean Rex Myers explains that before there were human beings in this region, there was no concern for the effects of stress on the plants

photo: Kevin Schmidt

A number of research projects at SDSU deal with the causes and effects of stress on humans. Increasing numbers of university-wide biostress related projects will bring together teams of scientists from across the campus.

and animals. So, from the liberal arts perspective, the human element is the critically important one.

Researchers such as those in the Department of Psychology, for example, have completed research in the scientific sense—some of which examine the effects of mental stress on both adults and young persons. Such stress can arise from environmental problems, including the economic difficulty associated with it, Myers said.

But many of the faculty in the humanities areas also explore the effects of environmental stress in a non-scientific sense—that is, to document and even take inspiration from the effects, not to experiment with them.

In the visual arts, sculpture and paintings—such as those in the Harvey Dunn collection—do this, he said. Scholars in rural sociology, literature, and other areas of the humanities also reflect the cause and effect of environmental stress in human terms.

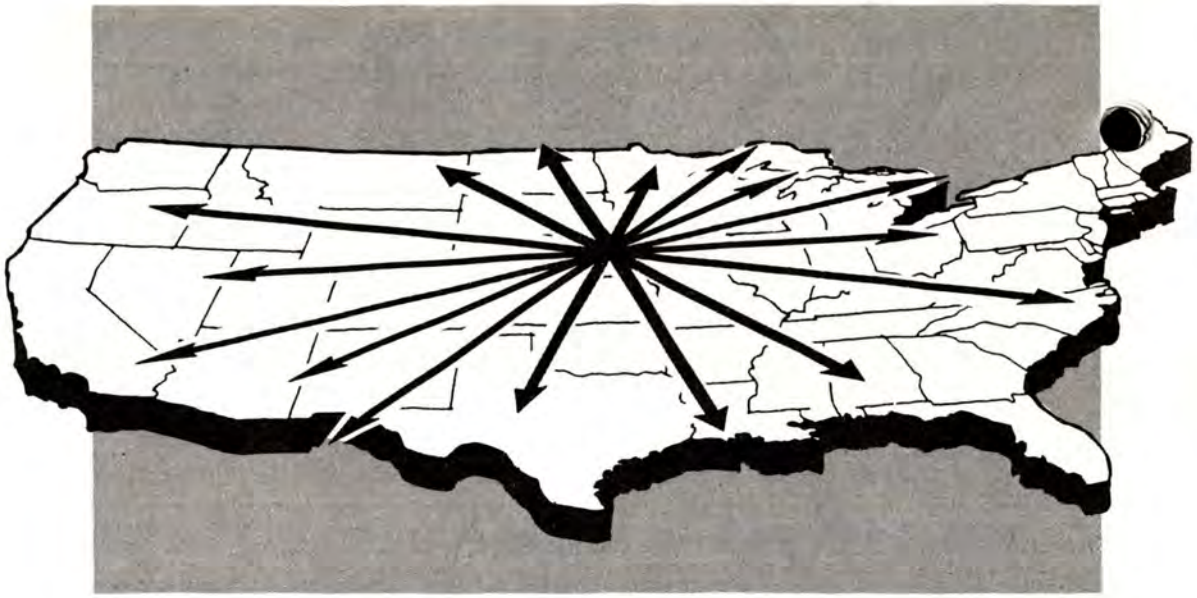
"In the Political Science area, we've examined many of the stresses that have taken place in this state: the populism, the progressivism, the various political party movements that have arisen, and the stress over issues such as taxation and ag versus urban politics," Myers said.

In the History Department, he continued, scholars are looking at the mobility and persistence of the population as influenced by environmental stresses. In other words, what environmental factors cause a people to move into an area? What other influences cause them later to move out? And how were some settlers and Native American groups able to persist in those areas despite those same environmental stresses?

These and similar questions will arise ever more frequently with the current emphasis on biostress research and related activity at SDSU.

This area of research is complex indeed, and it involves the entire institution from Art to Zoology and beyond.

The writer is Dr. Larry Tennyson, Department of Agricultural Communications, SDSU.



Regional lab concept 'like being neighborly'

Sharing resources with our neighbors--the other states in the region-- will strengthen ties and benefit all the states involved

The Northern Plains Biostress Laboratory (NPBL) will be a good neighbor to other states in the region, sharing new knowledge, sharing ideas, sharing people, sharing germ plasm.

The Laboratory will enable South Dakota State University to build on the strong regional linkages the university already has in place with research and Extension, according to Dr. David Bryant, dean of the College of Agriculture and Biological Sciences at SDSU.

"The whole focus here will be to share resources, realizing no one state in the region can do everything, but by working together we can do a lot more for our individual states," said Bryant.

The NPBL—the building —will be a research facility on the SDSU campus housing scientists from several departments and disciplines as they explore environmental stress effects on plants, animals and humans.

But the NPBL—the concept—goes well beyond the walls of the new building to other disciplines on campus and to other universities in nearby states in the common effort to improve the rural economy through stabilizing agricultural productivity in the region.

Developing and gaining support for a regional laboratory facility "has been a natural thing from my perspective to do," said Bryant. "We (SDSU) have done it (shared) for so long, have had such a good track

record, have been such a good neighbor in the region, it is a natural thing to continue, to build on, and to enhance."

The Biostress Laboratory, now about to become a reality, couldn't have made it without support from surrounding states. The North Dakota Congressional delegation joined their South Dakota counterparts to "make it happen" in Washington.

The plan has also been supported all along by the ag college administrators at land-grant universities in North Dakota, Minnesota, Nebraska, Montana and Wyoming. These administrators can readily see benefits to clientele in their own states—benefits from past cooperation and benefits from expected cooperation with SDSU in research and Extension activities.

Dr. Roald Lund, dean of agriculture at NDSU, said he anticipated from the beginning that the research from this facility would benefit his clientele in North Dakota, and that is why he supported it. "This is an arrangement similar to the one we have with veterinary diagnostic laboratories. There is quite a bit of exchange across state lines for veterinary services," Lund said.

"With research on plants, as we breed plants tolerant to low soil ph, humidity, and moisture conditions, I'm sure some of the results of the Biostress Lab will reach into North Dakota."

"Agriculture in North Dakota is a $2.5-billion-a-year enterprise, so the research done by the Biostress Lab on crops will be very important to us."

Lund said that in past planning sessions with Bryant, they recognized how the Northern Crops Institute (NCI) at Fargo, N.D., benefits South Dakota, and South Dakota participates in the NCI financially, as does Minnesota and Montana. "We've extended this kind of thinking to this support for the proposed Northern Livestock Institute," Lund said. This is another example of regional thinking.

Lund pointed out that Congressional delegations from South Dakota, North Dakota, and several states support the drive for federal funding for the Biostress Lab. "I feel these informal regional arrangements are important."

Lund said the Biostress Lab is just another in the continuing effort by the two, three, and sometimes four states to share in supporting common initiatives.

Lund added that since 1955, 25 percent of all Hatch Act dollars had to be spent on regional research, so the model of regional research has been around on the federal side of funding for 36 years. North Dakota and South Dakota are in the North Central Region where several million in federal dollars are spent each year on regional research. "I think the more examples of intrastate and interstate cooperation we have, the better off we are."

Bryant also cited numerous examples of past and present SDSU cooperation across state lines. They include:

- The work with North Dakota and the Northern Crops Institute on the campus of NDSU. The South Dakota Legislature annually contributes to the budget of the institute which promotes and markets crops from this region at home and abroad.
- The oilseeds research programs of SDSU and NDSU involving sunflowers and flax. These two programs have been cooperating for years.
- SDSU's new Comprehensive Soybean Research Program. "This brand new development we see as a model for future Biostress Lab research," Bryant said. SDSU has hired a new soybean research

". . . no one state in the region can do everything, but by working together we can do a lot more for our individual states"

--David Bryant

photo: M.K. McFarland

David Bryant, dean of the College of Agriculture and Biological Sciences, believes SDSU has always been a good neighbor in the region. The NPBL will continue and enhance this spirit of shared research.

agronomist, Dr. Roy Scott, who has contacted soybean breeders in North Dakota and Minnesota, paving way for SDSU involvement in their winter nursery program Scott also is involved in cooperation in varietal development as well as obtaining germ plasm from both states for testing here.

The soybean effort, Bryant explained, builds on the involvement with the Northern Crops Institute. It builds on oilseed programs already in place. It further builds on the Regional Weeds Research and Extension Program proposed by NDSU for the northern tier of states—Minnesota, North Dakota, South Dakota, Montana and Wyoming.

• The Northern Regional Agricultural Utilization Consortium, a proposal developed a year ago, involves the two Dakotas and Minnesota in a research effort funded by federal dollars, $500,000 of which was received last year from Congress. This consortium is focusing on developing new products from existing ag commodities. Dr. Jim Males, head of SDSU's Animal and Range Sciences Department, is chairman of the livestock and meats subcommittee of this consortium.

Along with the Biostress Lab, this consortium will serve as a mechanism for developing new technologies that will be transmitted to producers through the Northern Livestock Institute, which is a technology transfer initiative, Bryant said. The Northern Regional Agricultural Utilization Consortium will be a natural feeder mechanism to the Northern Livestock Institute, Bryant said.

• The U.S. Meat Animal Research Center in Nebraska has a strong linkage with SDSU, "something we will build upon from the animal biostress research standpoint," Bryant said.

• SDSU's continuing involvement in the Ph.D. program in agricultural engineering at Iowa State University will look at the human stress component from the ag engineering side, for example safety in the engineering of structures and equipment.

• The National Dairy Food Research Center involves SDSU and the University of Minnesota in a cooperative agreement. This, one of six national dairy food research centers, is headquartered on the University of Minnesota campus, although staff are used from both universities.

• A new regional initiative in the development stage is a regional sheep research and development program involving the two Dakotas, Montana and Wyoming. A meeting was held at Hettinger, N.D., during the Hettinger Sheep Days, with Bryant, Dr. Roald Lund, and Dr. Bob Heil, dean of the College of Agriculture at the University of Wyoming. The three will meet again in April and September to finalize the regional sheep research and extension program.

The Biostress Lab will also have a human stress component which is one example of a biostress program which will not be physically located in the structure. Bryant reported that a new proposal is on the table for a federally funded rural mental health center to be located in SDSU's Rural Sociology Department. Dr. Donna Hess, professor of sociology, will be the person in charge. Bryant said that when he and others first approached USDA's Cooperative States Research Service about the Biostress Lab, the CSRS encouraged them to expand the scope of the project from state and regional to national and global, because of the

photo: Ag Com photo file

Biostress can come in many forms--drought, disease, insects, blizzards--and it has no respect for borders. The NPBL will cross borders, too, as SDSU researchers team-up with 'neighbors' to solve common problems.

national and global application of climatic stress research.

Bryant said he does visualize this laboratory promoting more exchanges of scientists and adjunct appointments here as has or is taking place with USDA's Agricultural Research Service on soybean research, USDA's Northern Grains Insect Research Laboratory and USDA's Ag Products Utilization Research Center at Peoria, Ill.

Dr. Maurice Horton, water grants coordinator for the Cooperative States Research Service in Washington, has been credited as one of the minds behind the concept of a biostress lab while he was head of the Plant Science Department at SDSU.

Horton said he was thinking about the environmental stresses placed on crops and livestock in the region, when Dr. Bryant picked up on it and added the "bio-" to biostress. "It just fit in very well with some of my feelings of needs for South Dakota and the region." The regional concept was there from the beginning, Horton indicated.

Dr. Ray Moore, director of the Agricultural Experiment Station at SDSU, another person involved in the idea, first discussed the stress concept as he and Dean Bryant drove by the university's Central Research Station at Highmore, a location where the climate puts considerable stress on plants, animals and humans any time of the year.

Moore believes persons from surrounding states will benefit from the biostress research in the same way South Dakotans will benefit. "The region this serves has the same kinds of stress conditions as we do, relating to plants, animals and humans," Moore said.

Moore summarized, perhaps as well as anyone, what regional research implies. "We just drop the state borders and we're one big region with the same general problems," he said.

Bryant said the motivation for the regional laboratory is to improve the economy of the region by increasing the profitability in agriculture, the number one industry of South Dakota and much of the region. "Improving the economy and stimulating jobs will help give our kids a reason to stay," Bryant concluded.

The writer is Jerry Leslie, Department of Agricultural Communications, SDSU.

"We just drop the state borders and we're one big region with the same general problems"

--R. A. Moore

research funding briefs

The South Dakota State University College of Agriculture and Biological Sciences receives grants and contracts for research and service projects. Here is a brief summary of the funds received in January and February, 1991:

• An additional $95,000 through the University of Minnesota for the SDSU/University of Minnesota Dairy Foods Research Center. *John Parsons, project director.*

• $26,725 from the U.S. Fish and Wildlife Service for the development of methods for evaluating economic values and social perspectives of Prairie Pothole Region wetlands. *Daniel Hubbard and Ken Higgins, project directors.*

• An additional $8,000 from the South Dakota Department of Game, Fish and Parks for various fisheries research projects. *David Willis, Charles Berry, and Walter Duffy, project directors.*

• An additional $26,243 from E. G. & G. Idaho, Inc. for a study of man made ponds. *Les Flake, project director.*

• $68,000 through the North Dakota Game and Fish Department for management of walleye and sauger in Lake Sakakawea. *David Willis and Charles Berry, project directors.*

•$25,000 from the March of Dimes Birth Defects Foundation for flow cytometric evaluation of human sperm chromatin structure as related to fertility and exposure to genotoxic agents. *Don Evenson, project director.*

• $28,600 from the Governor's Office of Economic Development for CITE project "Increasing the value of South Dakota's calf crop." *John Wagner, project director.*

• $137,366 from the U.S. Department of Agriculture/Animal and Plant Health Inspection Service FY91 Grasshopper Integrated Pest Management. *Billy Fuller, project director.*

• $13,000 from the South Dakota Groundwater Protection Fund for evaluation and demonstration of management techniques. *David Clay, project director.*

• $48,580 from the National Science Foundation for the use of Xenopus oocyte/mRNA injection system for study of plant receptors. *Fedora Sutton, project director.*

• $28,720 in continuing funding from USDA/APHIS for FY91 Cooperative Agricultural Pest Survey Program. *Dale Gallenberg, project director.*

• $1,600 through the South Dakota Department of Social Services to mail caregiving newsletter. *Lynette Olson, project director.*

• $40,088 through Iowa State University to utilize Senior Series program guides. *Lynette Olson, project director.*

College of Agriculture and Biological Sciences
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Calendar of Events

Date	Event	Person to Contact
June		
4-7	South Dakota Youth Range Camp, Ft. Meade, Sturgis	Sandra Wyman, SCS Office, Kennebec
10-13	State 4-H Conference, SDSU, Brookings	Mary Ellen Aamot, Extension 4-H Youth Specialist, SDSU
13	SDSU Sheep Day, Animal Science Arena, Brookings	Jeff Held, Extension Sheep Specialist, SDSU
20	SDSU Plant Science Farm Twilight Tour, Brookings (date tentative)	Bob Hall, Extension Crops Specialist, SDSU/ Bob Kohl, Superintendent, SDSU
26	Summer Crops Tour, Southeast Experiment Farm, Beresford	Dale Sorenson, Manager, Beresford
27	Summer Field Day, Dakota Lakes Research Farm, southeast of Pierre	Dwayne Beck, Superintendent, SDSU
July		
9	Summer Twilight Tour, Northeast Research Station, north of Watertown	Jim Smolik, Superintendent, SDSU
16-18	State 4-H Horse Show, Fairgrounds, Huron	Rich Howard, 4-H/Youth Specialist, SDSU
August		
22	Field Day, Dakota Lakes Research Farm, southeast of Pierre	Dwayne Beck, Superintendent, SDSU
27-Sept. 2	State Fair, Fairgrounds, Huron	Carolyn Clague, 4-H/Youth Specialist, SDSU
September		
10	Northeast Research Station Fall Field Day (tentative)	Jim Smolik, Superintendent, SDSU
December		
3-6	Five-State Range Beef Cow Symposium, Ft. Collins, Colorado	Terry Goehring, Extension Beef Specialist, Rapid City